Scientific Inquiry

3-1 The student will demonstrate an understanding of scientific inquiry, including the processes, skills, and mathematical thinking necessary to conduct a simple scientific investigation.

3-1.5 Use tools (including beakers, meter tapes and sticks, forceps/tweezers, tuning forks, graduated cylinders, and graduated syringes) safely, accurately, and appropriately when gathering specific data.
Taxonomy Level: 3.2-B Apply Conceptual Knowledge

Previous/Future knowledge: In previous grades, students used magnifiers and eyedroppers (K-1.2), rulers (1-1.2), and thermometers, rain gauges, balances, and measuring cups (2-1.2) safely, accurately, and appropriately. In future grades, students will continue to use these tools, when appropriate, as well as use new tools when collecting scientific data. A complete list of tools can be found in Appendix A of the Academic Standards.

It is essential for students to know that every simple scientific investigation provides information. This information is called *data*. Data can be simple observations or measurements (in metric units or English units when appropriate).

It is essential for students to know that different tools are needed to collect different kinds of data.

- A *beaker* is a tool that measures liquid volume.
  - To read the volume of a liquid in a beaker, place the tool on a level surface.
  - When using a beaker to measure the volume of a granular (powdered) solid, be sure the top surface of the solid is level.
  - Choose the appropriate size beaker for the measurement task—use small beakers for measuring small amounts, and large beakers for large amounts.
  - A beaker measures the volume in metric units such as milliliters (mL) or liters (L).
- A *meter tape, or meter stick,* is a measurement tool that can be used to measure the length, width, or height of an object or the distance between two objects.
  - When using a meter tape, or stick, make sure to begin measuring from the zero (0) mark, not necessarily the edge of the tool.
  - A meter tape, or stick, measures in metric units such as centimeters (cm) or meters (m).
- *Forceps/tweezers* are tools that grasp or pick up small materials.
- A *tuning fork* is a tool that produces vibrations when struck appropriately.
  - Use the rubber mallet or rubber surface to strike the tuning fork.
- A *graduated cylinder* is a tool that measures volume of liquids.
  - To read the graduated cylinder, place the tool on a level surface.
  - Choose the right size graduated cylinder for the measurement task—use small graduated cylinder for measuring small amounts, and large graduated cylinder for large amounts.
  - The graduated marks are in metric units such as milliliters (mL).
- A *graduated syringe* is a tool that measures volume of liquids.
  - Place the end of the syringe in the liquid and then pull the plunger out to draw in the appropriate amount of liquid.
  - A graduated syringe measures in metric units such as milliliters (mL).

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It is essential for students to use care when handling these tools when gathering data.

- Some beakers and graduated cylinders are glass. Care should be taken not to break them.
- Forceps can be sharp. Care should be taken not to pinch or pierce someone.
- To avoid breaking or chipping, tuning forks should not be struck on the side of the desk.
- Care should be taken when heating glass beakers.

It is also essential for students to use tools from previous grade levels that are appropriate to the content of this grade level such as eyedroppers, magnifiers, rulers (measuring to millimeters), pan balances (measuring in grams), measuring cups (measuring in parts of a cup), or thermometers (measuring in ^{o}F and ^{o}C) to gather data.

NOTE TO TEACHER: See information in previous grades regarding how to use each tool. All temperature readings during investigations will be taken using the Celsius scale unless the data refers to weather when the Fahrenheit scale is used.

It is not essential for students to use triple beam balances. Tools from previous grades that are not appropriate to the content of this grade level are not essential; however, these terms may be used as distracters (incorrect answer options) for assessment, for example rain gauges. Students do not need to measure the volume of a solid using displacement. Students do not need to convert measurements from English to metric or metric to English.

Assessment Guidelines:
The objective of this indicator is to *use* tools safely, accurately, and appropriately when gathering data; therefore, the primary focus of assessment should be to apply correct procedures to the use of beakers, meter tapes and sticks, forceps/tweezers, tuning forks, graduated cylinders, and graduated syringes and other tools essential to the grade level that would be needed to conduct a science investigation. However, appropriate assessments should also require students to *identify* appropriate uses for beakers, meter tapes and sticks, forceps/tweezers, tuning forks, graduated cylinders, and graduated syringes; *illustrate* the appropriate tool for an investigation using pictures, diagrams, or words; *recall* how to accurately determine the measurement from the tool; *recognize* the correct metric units for each tool (such as mL for measuring volume with a graduated cylinder); or *recognize* ways to use science tools safely, accurately, and appropriately.